

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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In re Patent Application of:  
John TWYNAM

Application No.: 10/762,572

Confirmation No.: 3031

Filed: January 23, 2004

Art Unit: 2815

For: COMPOUND SEMICONDUCTOR FET

Examiner: E. Lee

**APPELLANT'S REPLY BRIEF**

MS Appeal Brief - Patents  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

**I. INTRODUCTION**

Pursuant to 37 C.F.R. § 1.193(b), Appellant submits this reply in response to the Examiner's Answer.

**II. ARGUMENT**

**A. The claim limitation “having a dopant concentration for reducing discontinuity of an electric field at an interface between the undoped AlN layer and the undoped GaN layer” is not merely an intended use.**

In the Examiner's Answer, the Examiner maintains that the claim limitation “having a dopant concentration for reducing discontinuity of an electric field at an interface between the undoped AlN layer and the undoped GaN layer” is merely an intended use. Appellant respectfully submits that this is contrary to the support in the specification. Paragraph [0018] of the specification explains that the dopant concentration of the n-type delta doped III-N layer is set so as

to reduce discontinuity of an electric field at an interface between the AlN layer and the III-N layer. At paragraph [0030], the specification explains that in the case of a sapphire substrate, the sheet doping concentration is selected to be within the range set forth in that paragraph because it is recognized that if the concentration is lower, hole charges due to the spontaneous polarization cannot be sufficiently compensated so that neither parallel conduction nor gate leak can be sufficiently reduced. Paragraph [0031] sets forth a desirable dopant concentration for a SiC substrate. The selection of the dopant concentration is not a use of a device but is rather an important aspect of designing the device itself which further defines the recited structural elements. While the act of reducing discontinuity may be an intended use, the selection of a dopant concentration is merely a feature of the design itself. Appellant submits that this feature should be given patentable weight.

**B. The claim limitation “having a dopant concentration for reducing discontinuity of an electric field at an interface between the undoped AlN layer and the undoped GaN layer” is not ambiguous.**

In the Examiner's Answer, the Examiner states that even if the feature of “having a dopant concentration for reducing discontinuity of an electric field at an interface between the undoped AlN layer and the undoped GaN layer” is given patentable weight, this feature is ambiguous what concentration would achieve this result. However, as set forth above, the specification clearly sets forth the desired range of dopant concentration which should be selected depending on the substrate used. In view of the specification, this would not be ambiguous to one of ordinary skill in the art.

**C. One of ordinary skill in the art would not have been motivated to combine Khan and Yamashita.**

Appellant respectfully submits that there would have been no motivation to modify Khan to provide an claimed n-type delta doped GaN layer interposed between the undoped AlN layer and the undoped GaN layer. Further, appellant submits that the Examiner is picking and choosing various elements of the cited references in an attempt to recreate the claimed invention in hindsight.

Yamashita discloses a channel layer 20 which includes a high-concentration delta doped layer 21 in its deeper portion (abstract). Yamashita teaches that since layer 21 is in the deeper portion of the channel layer, the electric field in the surface region of the channel layer is weakened, thereby allowing the current driving force to increase (abstract). Yamashita does not teach or suggest that including a n-type delta doped GaN layer between an undoped AlN layer and an undoped GaN layer realizes this result. Rather, this result is owed to the fact that the high-concentration delta doped layer 21 in the deeper portion of the well layer. Thus, at best, one of ordinary skill would have been motivated by the teachings of Yamashita to include a high-concentration delta doped layer 21 in the deeper portion of a well layer, but not to provide an n-type delta doped GaN layer between an undoped AlN layer and an undoped GaN layer.

Further, Khan discloses a HEMT of AlGaIn/GaN type, whereas Yamashita discloses a MISFET. The  $\delta$  doped layer 21 of Yamashita is included in a part of the channel layer 20. Because the HEMT is not provided with a "channel layer," one of ordinary skill in the art would not have been motivated to incorporate the  $\delta$  doped layer 21 of Yamashita into the HEMT as disclosed in Khan.

Furthermore, the invention claimed in claim 1 intends to reduce the 2HG generated due to discontinuity of the electric field at the heterojunction in the HEMT. However, Yamashita does not disclose nor teach reducing the 2HG in the HEMT.

For at least the reasons stated above, one of ordinary skill in the art would not have been motivated to modify Khan in view of Yamashita to achieve the claimed invention. Accordingly, appellant requests that this rejection be reversed.

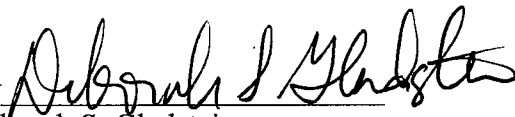
### III. CONCLUSION

For the foregoing reasons, Appellant respectfully submits that the points raised in the Examiner's Answer do not overcome Appellant's Appeal Brief. Therefore, Appellant respectfully requests that this Board reverse the rejection imposed by the Patent Office.

In the event the U.S. Patent and Trademark Office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to Deposit Account No. 03-1952 referencing docket no. 204552031600.

Dated: May 9, 2008

Respectfully submitted,

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